

NODE=B014

N(1710) 1/2⁺

$$I(J^P) = \frac{1}{2}(\frac{1}{2}^+) \text{ Status: } ***$$

Most of the results published before 1975 were last included in our 1982 edition, Physics Letters **111B** 1 (1982). Some further obsolete results published before 1984 were last included in our 2006 edition, Journal of Physics, G **33** 1 (2006).

The latest GWU analysis (ARNDT 06) finds no evidence for this resonance.

N(1710) BREIT-WIGNER MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1680 to 1740 (\approx 1710) OUR ESTIMATE			
1710±20	ANISOVICH	12A	DPWA Multichannel
1700±50	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
1723± 9	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1662± 7	SHRESTHA	12A	DPWA Multichannel
1725±25	ANISOVICH	10	DPWA Multichannel
1729±16	¹ BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
1752± 3	PENNER	02C	DPWA Multichannel
1699±65	VRANA	00	DPWA Multichannel
1720±10	ARNDT	96	IPWA $\gamma N \rightarrow \pi N$
1717±28	MANLEY	92	IPWA $\pi N \rightarrow \pi N & N\pi\pi$
1706	CUTKOSKY	90	IPWA $\pi N \rightarrow \pi N$
1730	SAXON	80	DPWA $\pi^- p \rightarrow \Lambda K^0$
1720	² LONGACRE	77	IPWA $\pi N \rightarrow N\pi\pi$
1710	³ LONGACRE	75	IPWA $\pi N \rightarrow N\pi\pi$

NODE=B014M

NODE=B014M

→ UNCHECKED ←

N(1710) BREIT-WIGNER WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
50 to 250 (\approx 100) OUR ESTIMATE			
200± 18	ANISOVICH	12A	DPWA Multichannel
93± 30	CUTKOSKY	90	IPWA $\pi N \rightarrow \pi N$
90± 30	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
120± 15	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
116± 17	SHRESTHA	12A	DPWA Multichannel
200± 35	ANISOVICH	10	DPWA Multichannel
180± 17	¹ BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
386± 59	PENNER	02C	DPWA Multichannel
143±100	VRANA	00	DPWA Multichannel
105± 10	ARNDT	96	IPWA $\gamma N \rightarrow \pi N$
480±230	MANLEY	92	IPWA $\pi N \rightarrow \pi N & N\pi\pi$
540	BELL	83	DPWA $\pi^- p \rightarrow \Lambda K^0$
550	SAXON	80	DPWA $\pi^- p \rightarrow \Lambda K^0$
120	² LONGACRE	77	IPWA $\pi N \rightarrow N\pi\pi$
75	³ LONGACRE	75	IPWA $\pi N \rightarrow N\pi\pi$

NODE=B014W

NODE=B014W

→ UNCHECKED ←

N(1710) POLE POSITION

REAL PART	DOCUMENT ID	TECN	COMMENT
1670 to 1770 (\approx 1720) OUR ESTIMATE			
1687±17	ANISOVICH	12A	DPWA Multichannel
1690	⁴ HOEHLER	93	SPED $\pi N \rightarrow \pi N$
1698	CUTKOSKY	90	IPWA $\pi N \rightarrow \pi N$
1690±20	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$

NODE=B014215

NODE=B014RE

NODE=B014RE

→ UNCHECKED ←

• • • We do not use the following data for averages, fits, limits, etc. • • •

1644	SHRESTHA	12A	DPWA	Multichannel
1708±18	ANISOVICH	10	DPWA	Multichannel
1711±15	¹ BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$
1679	VRANA	00	DPWA	Multichannel
1770	ARNDT	95	DPWA	$\pi N \rightarrow N\pi$
1636	ARNDT	91	DPWA	$\pi N \rightarrow \pi N$ Soln SM90
1708 or 1712	⁵ LONGACRE	78	IPWA	$\pi N \rightarrow N\pi\pi$
1720 or 1711	² LONGACRE	77	IPWA	$\pi N \rightarrow N\pi\pi$

-2xIMAGINARY PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
-------------	-------------	------	---------

80 to 380 (≈ 230) OUR ESTIMATE

200±25	ANISOVICH	12A	DPWA	Multichannel
200	⁴ HOEHLER	93	SPED	$\pi N \rightarrow \pi N$
88	CUTKOSKY	90	IPWA	$\pi N \rightarrow \pi N$
80±20	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
104	SHRESTHA	12A	DPWA	Multichannel
200±20	ANISOVICH	10	DPWA	Multichannel
174±16	¹ BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$
132	VRANA	00	DPWA	Multichannel
378	ARNDT	95	DPWA	$\pi N \rightarrow N\pi$
544	ARNDT	91	DPWA	$\pi N \rightarrow \pi N$ Soln SM90
17 or 22	⁵ LONGACRE	78	IPWA	$\pi N \rightarrow N\pi\pi$
123 or 115	² LONGACRE	77	IPWA	$\pi N \rightarrow N\pi\pi$

NODE=B014IM

NODE=B014IM

→ UNCHECKED ←

N(1710) ELASTIC POLE RESIDUE

MODULUS |r|

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
6±4	ANISOVICH	12A	DPWA
15	HOEHLER	93	SPED
9	CUTKOSKY	90	IPWA
8±2	CUTKOSKY	80	IPWA
• • • We do not use the following data for averages, fits, limits, etc. • • •			
24	¹ BATINIC	10	DPWA
37	ARNDT	95	DPWA
149	ARNDT	91	DPWA

NODE=B014220

NODE=B014RER

NODE=B014RER

PHASE θ

VALUE (°)	DOCUMENT ID	TECN	COMMENT
120±70	ANISOVICH	12A	DPWA
-167	CUTKOSKY	90	IPWA
175±35	CUTKOSKY	80	IPWA
• • • We do not use the following data for averages, fits, limits, etc. • • •			
20	¹ BATINIC	10	DPWA
-167	ARNDT	95	DPWA
149	ARNDT	91	DPWA

NODE=B014IMR

NODE=B014IMR

N(1710) INELASTIC POLE RESIDUE

The "normalized residue" is the residue divided by $\Gamma_{pole}/2$.

Normalized residue in $N\pi \rightarrow N(1710) \rightarrow N\eta$

MODULUS (%)	PHASE (°)	DOCUMENT ID	TECN	COMMENT
12±4	0 ± 45	ANISOVICH	12A	DPWA

NODE=B014250

NODE=B014250

NODE=B014RS1

NODE=B014RS1

Normalized residue in $N\pi \rightarrow N(1710) \rightarrow \Lambda K$

MODULUS (%)	PHASE (°)	DOCUMENT ID	TECN	COMMENT
17±6	-110 ± 20	ANISOVICH	12A	DPWA

NODE=B014RS2

NODE=B014RS2

N(1710) DECAY MODES

The following branching fractions are our estimates, not fits or averages.

Mode	Fraction (Γ_i/Γ)	
$\Gamma_1 N\pi$	5–20 %	DESIG=1;OUR EST
$\Gamma_2 N\eta$	10–30 %	DESIG=2;OUR EST
$\Gamma_3 N\omega$	(13.0±2.0) %	DESIG=12
$\Gamma_4 \Lambda K$	5–25 %	DESIG=3;OUR EST
$\Gamma_5 \Sigma K$		DESIG=4
$\Gamma_6 N\pi\pi$	40–90 %	DESIG=5;OUR EST
$\Gamma_7 \Delta\pi$	15–40 %	DESIG=181;OUR EST
$\Gamma_8 \Delta(1232)\pi$, P-wave		DESIG=6
$\Gamma_9 N\rho$	5–25 %	DESIG=182;OUR EST
$\Gamma_{10} N\rho$, S=1/2, P-wave		DESIG=7
$\Gamma_{11} N\rho$, S=3/2, P-wave		DESIG=8
$\Gamma_{12} N(\pi\pi)^{I=0}_{S\text{-wave}}$	10–40 %	DESIG=9;OUR EST
$\Gamma_{13} p\gamma$	0.002–0.08 %	DESIG=184;OUR EST
$\Gamma_{14} p\gamma$, helicity=1/2	0.002–0.08 %	DESIG=10;OUR EST
$\Gamma_{15} n\gamma$	0.0–0.02%	DESIG=186;OUR EST
$\Gamma_{16} n\gamma$, helicity=1/2	0.0–0.02%	DESIG=11;OUR EST

N(1710) BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{\text{total}}$	Γ_1/Γ	
VALUE (%)	DOCUMENT ID	TECN COMMENT
5 to 20 OUR ESTIMATE		
5±4	ANISOVICH	12A DPWA Multichannel
20±4	CUTKOSKY	80 IPWA $\pi N \rightarrow \pi N$
12±4	HOEHLER	79 IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •		
15±4	SHRESTHA	12A DPWA Multichannel
12±6	ANISOVICH	10 DPWA Multichannel
22±24	¹ BATINIC	10 DPWA $\pi N \rightarrow N\pi, N\eta$
14±8	PENNER	02C DPWA Multichannel
27±13	VRANA	00 DPWA Multichannel
9±4	MANLEY	92 IPWA $\pi N \rightarrow \pi N \& N\pi\pi$
$\Gamma(N\eta)/\Gamma_{\text{total}}$	Γ_2/Γ	
VALUE (%)	DOCUMENT ID	TECN COMMENT
10 to 30 OUR ESTIMATE		
17±10	ANISOVICH	12A DPWA Multichannel
36±11	PENNER	02C DPWA Multichannel
6±1	VRANA	00 DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •		
11±7	SHRESTHA	12A DPWA Multichannel
6±8	¹ BATINIC	10 DPWA $\pi N \rightarrow N\pi, N\eta$
$\Gamma(N\omega)/\Gamma_{\text{total}}$	Γ_3/Γ	
VALUE (%)	DOCUMENT ID	TECN COMMENT
13±2	PENNER	02C DPWA Multichannel
$(\Gamma_1\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1710) \rightarrow \Lambda K$	$(\Gamma_1\Gamma_4)^{1/2}/\Gamma$	
VALUE	DOCUMENT ID	TECN COMMENT
+0.12 to +0.18 OUR ESTIMATE		
+0.16	BELL	83 DPWA $\pi^- p \rightarrow \Lambda K^0$
+0.14	SAXON	80 DPWA $\pi^- p \rightarrow \Lambda K^0$
$\Gamma(\Lambda K)/\Gamma_{\text{total}}$	Γ_4/Γ	
VALUE (%)	DOCUMENT ID	TECN COMMENT
5 to 25 OUR ESTIMATE		
23±7	ANISOVICH	12A DPWA Multichannel
5±3	SHKLYAR	05 DPWA Multichannel
5±2	PENNER	02C DPWA Multichannel
10±10	VRANA	00 DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •		
8±4	SHRESTHA	12A DPWA Multichannel

$\Gamma(\Sigma K)/\Gamma_{\text{total}}$

VALUE (%)	DOCUMENT ID	TECN	COMMENT	Γ_5/Γ
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
7±7	PENNER	02C	DPWA Multichannel	

 $(\Gamma_f \Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1710) \rightarrow \Sigma K$

VALUE	DOCUMENT ID	TECN	COMMENT	$(\Gamma_1 \Gamma_5)^{1/2}/\Gamma$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
-0.034	LIVANOS	80	DPWA $\pi p \rightarrow \Sigma K$	

Note: Signs of couplings from $\pi N \rightarrow N\pi\pi$ analyses were changed in the 1986 edition to agree with the baryon-first convention; the overall phase ambiguity is resolved by choosing a negative sign for the $\Delta(1620) S_{31}$ coupling to $\Delta(1232)\pi$.

 $(\Gamma_f \Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1710) \rightarrow \Delta(1232)\pi$, P-wave

VALUE	DOCUMENT ID	TECN	COMMENT	$(\Gamma_1 \Gamma_8)^{1/2}/\Gamma$
± 0.16 to ± 0.22 OUR ESTIMATE				
-0.17	2 LONGACRE	77	IPWA $\pi N \rightarrow N\pi\pi$	
+0.20	3 LONGACRE	75	IPWA $\pi N \rightarrow N\pi\pi$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
-0.21±0.04	MANLEY	92	IPWA $\pi N \rightarrow \pi N$ & $N\pi\pi$	

 $\Gamma(\Delta(1232)\pi, P\text{-wave})/\Gamma_{\text{total}}$

VALUE (%)	DOCUMENT ID	TECN	COMMENT	Γ_8/Γ
39±8	VRANA	00	DPWA Multichannel	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
6±3	SHRESTHA	12A	DPWA Multichannel	

 $(\Gamma_f \Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1710) \rightarrow N\rho, S=1/2$, P-wave

VALUE	DOCUMENT ID	TECN	COMMENT	$(\Gamma_1 \Gamma_{10})^{1/2}/\Gamma$
± 0.09 to ± 0.19 OUR ESTIMATE				
+0.19	2 LONGACRE	77	IPWA $\pi N \rightarrow N\pi\pi$	
-0.20	3 LONGACRE	75	IPWA $\pi N \rightarrow N\pi\pi$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
+0.05±0.06	MANLEY	92	IPWA $\pi N \rightarrow \pi N$ & $N\pi\pi$	

 $\Gamma(N\rho, S=1/2, P\text{-wave})/\Gamma_{\text{total}}$

VALUE (%)	DOCUMENT ID	TECN	COMMENT	Γ_{10}/Γ
17±1	VRANA	00	DPWA Multichannel	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
17±6	SHRESTHA	12A	DPWA Multichannel	

 $(\Gamma_f \Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1710) \rightarrow N\rho, S=3/2$, P-wave

VALUE	DOCUMENT ID	TECN	COMMENT	$(\Gamma_1 \Gamma_{11})^{1/2}/\Gamma$
+0.31	2 LONGACRE	77	IPWA $\pi N \rightarrow N\pi\pi$	

 $(\Gamma_f \Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1710) \rightarrow N(\pi\pi)_{S\text{-wave}}^{I=0}$

VALUE	DOCUMENT ID	TECN	COMMENT	$(\Gamma_1 \Gamma_{12})^{1/2}/\Gamma$
± 0.14 to ± 0.22 OUR ESTIMATE				
-0.26	2 LONGACRE	77	IPWA $\pi N \rightarrow N\pi\pi$	
-0.28	3 LONGACRE	75	IPWA $\pi N \rightarrow N\pi\pi$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
+0.04±0.05	MANLEY	92	IPWA $\pi N \rightarrow \pi N$ & $N\pi\pi$	

 $\Gamma(N(\pi\pi)_{S\text{-wave}}^{I=0})/\Gamma_{\text{total}}$

VALUE (%)	DOCUMENT ID	TECN	COMMENT	Γ_{12}/Γ
1±1	VRANA	00	DPWA Multichannel	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
<1	SHRESTHA	12A	DPWA Multichannel	

NODE=B014R16
NODE=B014R16

NODE=B014R4
NODE=B014R4

NODE=B014310

NODE=B014R5
NODE=B014R5
→ UNCHECKED ←

NODE=B014R13
NODE=B014R13

NODE=B014R6
NODE=B014R6
→ UNCHECKED ←

NODE=B014R12
NODE=B014R12

NODE=B014R7
NODE=B014R7

NODE=B014R8
NODE=B014R8
→ UNCHECKED ←

NODE=B014R14
NODE=B014R14

N(1710) PHOTON DECAY AMPLITUDES

Papers on γN amplitudes predating 1981 may be found in our 2006 edition, Journal of Physics, G **33** 1 (2006).

$N(1710) \rightarrow p\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE (GeV ^{-1/2})	DOCUMENT ID	TECN	COMMENT
0.024±0.010 OUR ESTIMATE			
0.052±0.015	ANISOVICH	12A	DPWA Multichannel
0.007±0.015	ARNNDT	96	IPWA $\gamma N \rightarrow \pi N$
0.006±0.018	CRAWFORD	83	IPWA $\gamma N \rightarrow \pi N$
0.028±0.009	AWAJI	81	DPWA $\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-0.008±0.003	SHRESTHA	12A	DPWA Multichannel
0.025±0.010	ANISOVICH	10	DPWA Multichannel
0.044	PENNER	02D	DPWA Multichannel
-0.037±0.002	LI	93	IPWA $\gamma N \rightarrow \pi N$

NODE=B014235

NODE=B014235

NODE=B014A1

NODE=B014A1

→ UNCHECKED ←

$N(1710) \rightarrow n\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE (GeV ^{-1/2})	DOCUMENT ID	TECN	COMMENT
-0.002±0.014 OUR ESTIMATE			
-0.002±0.015	ARNNDT	96	IPWA $\gamma N \rightarrow \pi N$
0.000±0.018	AWAJI	81	DPWA $\gamma N \rightarrow \pi N$
-0.001±0.003	FUJII	81	DPWA $\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.017±0.003	SHRESTHA	12A	DPWA Multichannel
-0.024	PENNER	02D	DPWA Multichannel
0.052±0.003	LI	93	IPWA $\gamma N \rightarrow \pi N$

NODE=B014A2

NODE=B014A2

→ UNCHECKED ←

$N(1710) \gamma p \rightarrow \Lambda K^+$ AMPLITUDES

$(\Gamma_i/\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $p\gamma \rightarrow N(1710) \rightarrow \Lambda K^+$		$(M_{1-} \text{ amplitude})$
VALUE (units 10^{-3})	DOCUMENT ID	TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •		
-10.6 ± 0.4	WORKMAN	90
-7.21	TANABE	89

NODE=B014240

NODE=B014LK1

NODE=B014LK1

$p\gamma \rightarrow N(1710) \rightarrow \Lambda K^+$ phase angle θ		$(M_{1-} \text{ amplitude})$
VALUE (degrees)	DOCUMENT ID	TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •		
215 ± 3	WORKMAN	90
176.3	TANABE	89

NODE=B014LP1

NODE=B014LP1

N(1710) FOOTNOTES

¹ BATINIC 10 finds evidence for a second P_{11} state with all parameters except for the phase of the pole residue very similar to the parameters we give here.

² LONGACRE 77 pole positions are from a search for poles in the unitarized T-matrix; the first (second) value uses, in addition to $\pi N \rightarrow N\pi\pi$ data, elastic amplitudes from a Saclay (CERN) partial-wave analysis. The other LONGACRE 77 values are from eyeball fits with Breit-Wigner circles to the T-matrix amplitudes.

³ From method II of LONGACRE 75: eyeball fits with Breit-Wigner circles to the T-matrix amplitudes.

⁴ See HOEHLER 93 for a detailed discussion of the evidence for and the pole parameters of N and Δ resonances as determined from Argand diagrams of πN elastic partial-wave amplitudes and from plots of the speeds with which the amplitudes traverse the diagrams.

⁵ LONGACRE 78 values are from a search for poles in the unitarized T-matrix. The first (second) value uses, in addition to $\pi N \rightarrow N\pi\pi$ data, elastic amplitudes from a Saclay (CERN) partial-wave analysis.

NODE=B014

NODE=B014IM;LINKAGE=BA

NODE=B014;LINKAGE=L7

NODE=B014;LINKAGE=L5

NODE=B010;LINKAGE=H9

NODE=B014;LINKAGE=L8

N(1710) REFERENCESFor early references, see Physics Letters **111B** 1 (1982).

ANISOVICH	12A	EPJ A48 15	A.V. Anisovich <i>et al.</i>	(BONN, PNPI)	REFID=54041
SHRESTHA	12A	PR C86 055203	M. Shrestha, D.M. Manley	(KSU)	REFID=54862
ANISOVICH	10	EPJ A44 203	A.V. Anisovich <i>et al.</i>	(BONN, PNPI)	REFID=53280
BATINIC	10	PR C82 038203	M. Batinic <i>et al.</i>	(ZAGR)	REFID=53552
ARNDT	06	PR C74 045205	R.A. Arndt <i>et al.</i>	(GWU)	REFID=51535
PDG	06	JPG 33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)	REFID=51004
SHKLYAR	05	PR C72 015210	V. Shklyar, H. Lenske, U. Mosel	(GIES)	REFID=50977
PENNER	02C	PR C66 055211	G. Penner, U. Mosel	(GIES)	REFID=49129
PENNER	02D	PR C66 055212	G. Penner, U. Mosel	(GIES)	REFID=49130
VRANA	00	PRPL 328 181	T.P. Vrana, S.A. Dytman,, T.-S.H. Lee	(PITT+)	REFID=47593
ARNDT	96	PR C53 430	R.A. Arndt, I.I. Strakovsky, R.L. Workman	(VPI)	REFID=44675
ARNDT	95	PR C52 2120	R.A. Arndt <i>et al.</i>	(VPI, BRCO)	REFID=44535
HOEHLER	93	πN Newsletter 9 1	G. Hohler	(KARL)	REFID=43821
LI	93	PR C47 2759	Z.J. Li <i>et al.</i>	(VPI)	REFID=43327
MANLEY	92	PR D45 4002	D.M. Manley, E.M. Saleski	(KSA) IJP	REFID=41535
Also		PR D30 904	D.M. Manley <i>et al.</i>	(VPI)	REFID=30071
ARNDT	91	PR D43 2131	R.A. Arndt <i>et al.</i>	(VPI, TELE) IJP	REFID=41467
CUTKOSKY	90	PR D42 235	R.E. Cutkosky, S. Wang	(CMU)	REFID=41262
WORKMAN	90	PR C42 781	R.L. Workman	(VPI)	REFID=43685
TANABE	89	PR C39 741	H. Tanabe, M. Kohno, C. Bennhold	(MANZ)	REFID=40997
Also		NC 102A 193	M. Kohno, H. Tanabe, C. Bennhold	(MANZ)	REFID=40998
BELL	83	NP B222 389	K.W. Bell <i>et al.</i>	(RL) IJP	REFID=30409
CRAWFORD	83	NP B211 1	R.L. Crawford, W.T. Morton	(GLAS)	REFID=30070
PDG	82	PL 111B 1	M. Roos <i>et al.</i>	(HELS, CIT, CERN)	REFID=41167
AWAJI	81	Bonn Conf. 352	N. Awaji, R. Kajikawa	(NAGO)	REFID=30067
Also		NP B197 365	K. Fujii <i>et al.</i>	(NAGO)	REFID=30068
FUJII	81	NP B187 53	K. Fujii <i>et al.</i>	(NAGO, OSAK)	REFID=30069
CUTKOSKY	80	Toronto Conf. 19	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP	REFID=30064
Also		PR D20 2839	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP	REFID=40096
LIVANOS	80	Toronto Conf. 35	P. Livanos <i>et al.</i>	(SACL) IJP	REFID=30402
SAXON	80	NP B162 522	D.H. Saxon <i>et al.</i>	(RHEL, BRIS) IJP	REFID=30404
HOEHLER	79	PDAT 12-1	G. Hohler <i>et al.</i>	(KARLT) IJP	REFID=30058
Also		Toronto Conf. 3	R. Koch	(KARLT) IJP	REFID=30859
LONGACRE	78	PR D17 1795	R.S. Longacre <i>et al.</i>	(LBL, SLAC)	REFID=30054
LONGACRE	77	NP B122 493	R.S. Longacre, J. Dolbeau	(SACL) IJP	REFID=30051
Also		NP B108 365	J. Dolbeau <i>et al.</i>	(SACL) IJP	REFID=30052
LONGACRE	75	PL 55B 415	R.S. Longacre <i>et al.</i>	(LBL, SLAC) IJP	REFID=30047

NODE=B014

NODE=B014